

appended claims.

WHAT IS CLAIMED IS:

- 1        1.        An ink-jet recording apparatus comprising:  
2                an ink-jet recording head mounted on a carriage which travels in the  
3        widthwise direction of a recording medium for recording an image thereon by  
4        ejecting ink droplets from nozzle orifices provided therewith;  
5                a flushing region situated on the traveling path of the carriage in at  
6        least one of non-print regions which are arranged both sides of a print region,  
7        the flushing region including an ink absorbing member for receiving ink  
8        droplets ejected from the recording head when a flushing operation is  
9        performed;  
10              capping means provided in one of the non-print regions for sealing the  
11        nozzle orifices; and  
12              a guide member disposed in the flushing region and having a slant  
13        surface on which the ink droplets land and flow toward the ink absorbing  
14        member.
- 1        2.        The ink-jet recording apparatus as set forth in claim 1, wherein the  
2        flushing region includes a plate member provided with an aperture through  
3        which the ink droplets pass, and  
4                wherein the aperture is situated between the recording head and the  
5        guide member.
- 1        3.        The ink-jet recording apparatus as set forth in claim 2, wherein the  
2        respective apertures are larger than a size of surface on which the nozzle

3 orifices are formed.

1 4. The ink-jet recording apparatus as set forth in claim 1, wherein an  
2 extending direction of the slant surface is arbitrarily selected with respect to the  
3 traveling direction of the carriage.

1 5. The ink-jet recording apparatus as set forth in claim 1, wherein a slant  
2 angle of the slant surface is set within a domain of  $30^\circ < \theta < 60^\circ$ .

1 6. The ink-jet recording apparatus as set forth in claim 1, wherein a  
2 water-repellent layer is formed on the slant surface.

1 7. The ink-jet recording apparatus as set forth in claim 1, wherein the  
2 recording head ejects a plurality colors of ink such that ink, which is easier to  
3 accumulate on the slant surface, lands on a lower position of the slant surface.

1 8. The ink-jet recording apparatus as set forth in claim 7, wherein a  
2 landing position of black ink is lower than landing positions of any other colors  
3 of ink.

1 9. The ink-jet recording apparatus as set forth in claim 1, wherein the  
2 guide member is provided as a plurality of plate members for receiving the ink  
3 droplets at a predetermined angle with respect to a flight direction of the ink  
4 droplets.

1     10.     The ink-jet recording apparatus as set forth in claim 9, wherein the  
2     plural plate members are arranged within a cylindrical casing at substantially  
3     equal intervals and at the predetermined angle.

1     11.     The ink-jet recording apparatus as set forth in claim 10, wherein a  
2     cylindrical guide body is extended from the cylindrical casing continuously and  
3     downwardly for leading the received ink to the ink absorbing member.

1     12.     The ink-jet recording apparatus as set forth in claim 9, wherein the  
2     predetermined angle is set within a domain of 40 to 80 degrees.

1     13.     The ink-jet recording apparatus as set forth in claim 1, wherein the  
2     flushing region is situated each of the non-print regions.

1     14.     The ink-jet recording apparatus as set forth in claim 1, wherein the  
2     flushing operation includes a first flushing for ejecting ink droplets of a first ink  
3     and a second flushing for ejecting ink droplets a second ink different from the  
4     first ink, and

5             wherein the first flushing is performed at a first position in the flushing  
6     region, and the second flushing is performed at a second position of the  
7     flushing region.

1     15.     The ink-jet recording apparatus as set forth in claim 14, wherein the  
2     first flushing and the second flushing is performed in order.

1 16. The ink-jet recording apparatus as set forth in claim 14, wherein the  
2 second flushing is performed without stopping the carriage.

1 17. The ink-jet recording apparatus as set forth in claim 14, wherein the  
2 first flushing is performed before the carriage starts to travel.

1 18. The ink-jet recording apparatus as set forth in claim 14, wherein the  
2 first flushing is performed without stopping the carriage.

1 19. The ink-jet recording apparatus as set forth in claim 14, wherein the  
2 first position and the second position are fixed.

1 20. The ink-jet recording apparatus as set forth in claim 14, wherein one  
2 of the first and second positions is fixed and the other is variable.

1 21. The ink-jet recording apparatus as set forth in claim 14, wherein the  
2 recording head includes three pairs of nozzle orifice arrays, and

3 wherein a distance X between the first and second positions satisfies  
4 one of the following relationships:

5  $L1-L2 \leq X \leq L1+L2$ , and

6  $2(L1-L2) \leq X \leq 2(L1+L2)$

7 where L1 denotes a distance between the respective pairs of nozzle orifice  
8 arrays, and L2 denotes a distance between the respective nozzle orifice  
9 arrays.

1     22.     The ink-jet recording apparatus as set forth in claim 14, wherein the  
2     first position is situated at an outer traveling limit of the carriage, and a second  
3     position is situated where is closer to the print region than the first position.

1     23.     The ink-jet recording apparatus as set forth in claim 22, wherein the  
2     first ink is black ink, and the second ink is at least one of cyan ink, magenta ink  
3     and yellow ink.

1     24.     The ink-jet recording apparatus as set forth in claim 22, wherein the  
2     first ink is at least one of cyan ink, magenta ink and yellow ink, and the second  
3     ink is black ink.

1     25.     The ink-jet recording apparatus as set forth in claim 1, further  
2     comprising a flushing position controller including means for inputting a value  
3     for adjusting a timing of outputting a flushing drive signal for triggering the  
4     flushing operation.

1     26.     The ink-jet recording apparatus as set forth in claim 25, wherein the  
2     adjusting value is inputted as a first value for correcting a preset flushing  
3     position of one of the nozzle orifice of the recording head.

1     27.     The ink-jet recording apparatus as set forth in claim 26, wherein the  
2     first correcting value is managed by counting reference pulses, and  
3             wherein a second correcting value for a preset flushing position of  
4     another nozzle orifice is managed by a delay time period from a flushing drive

5 signal based on the first correcting value.

1 28. The ink-jet recording apparatus as set forth in claim 26, wherein the  
2 first correcting value is managed by counting reference pulses, and  
3 wherein a second correcting value for a preset flushing position of  
4 another nozzle orifice is also managed by counting the reference pulses.

1 29. The ink-jet recording apparatus as set forth in claim 26, wherein the  
2 reference pulses is an encoder signal generated according to the traveling of  
3 the carriage.

1 30. The ink-jet recording apparatus as set forth in claim 29, further  
2 comprising a non-volatile memory for storing the correcting values, and  
3 wherein the output timing of the flushing drive signal is determined  
4 with reference to the correcting values in the non-volatile memory and the  
5 encoder signal.

1 31. The ink-jet recording apparatus as set forth in claim 25, further  
2 comprising a plate member provided with an aperture situated in the flushing  
3 region,

4 wherein the aperture is situated between the recording head and the  
5 guide member, and

6 wherein the aperture is smaller than a size of surface on which the  
7 nozzle orifices are formed.

1     32.     The ink-jet recording apparatus as set forth in claim 25, wherein the  
2     nozzle orifices form a plurality of nozzle rows in the recording head; and  
3             wherein the flushing position controller controls the flushing operation  
4     such that each nozzle row coming to a predetermined flushing position starts  
5     to eject ink drops.

1     33.     The ink-jet recording apparatus as set forth in claim 32, wherein a  
2     nozzle row arranged further from the moving direction of the carriage when the  
3     flushing operation is performed is used for ejecting ink which requires less  
4     flushing operation.

1     34.     The ink-jet recording apparatus as set forth in claim 32, wherein the  
2     flushing operation is performed when the carriage is accelerated.

1     35.     The ink-jet recording apparatus as set forth in claim 25, wherein the  
2     nozzle orifices form a plurality of nozzle rows in the recording head; and  
3             wherein the flushing position controller controls the flushing operation  
4     such that all nozzle rows ejects ink drops when the carriage starts to move.

1     36.     The ink-jet recording apparatus as set forth in claim 35, wherein a  
2     nozzle row arranged further from the moving direction of the carriage when the  
3     flushing operation is performed is used for ejecting ink which requires less  
4     flushing operation.



1 37. The ink-jet recording apparatus as set forth in claim 1, further  
2 comprising a ventilation fan,  
3 wherein the ventilation fan is halted during the flushing operation.

1 38. An ink-jet recording apparatus comprising:  
2 an ink-jet recording head mounted on a carriage which travels in the  
3 widthwise direction of a recording medium for recording an image thereon by  
4 ejecting ink droplets from nozzle orifices provided therewith; and  
5 a flushing region situated on the traveling path of the carriage in at  
6 least one of non-print regions which are arranged both sides of a print region,  
7 the flushing region including a porous sheet member for receiving ink droplets  
8 ejected from the recording head when a flushing operation is performed, and  
9 an ink absorbing member for absorbing ink received by the porous sheet  
10 member.

1 39. The ink-jet recording apparatus as set forth in claim 38, wherein a  
2 distance between the porous sheet member and a surface on which the nozzle  
3 orifices are formed is set within a domain of 1 to 5 mm when the flushing  
4 operation is performed.

1 40. The ink-jet recording apparatus as set forth in claim 38, wherein the  
2 porous sheet member is hydrophilic.

1 41. The ink-jet recording apparatus as set forth in claim 38, wherein a  
2 mean pore size of the porous sheet is set within a domain of 100 to 500  $\mu\text{m}$ .

1     42.     The ink-jet recording apparatus as set forth in claim 38, wherein the  
2     periphery of the porous sheet member is enclosed by a case, and  
3             wherein the ink ejected during flushing operation flows along the  
4     interior of the case and is absorbed by the ink absorbing member.

1     43.     The ink-jet recording apparatus as set forth in claim 41, wherein a  
2     lower end of the porous sheet member contacts with an inner face of the  
3     casing.

1     44.     The ink-jet recording apparatus as set forth in claim 43, wherein the  
2     lower end of the porous sheet member is partially notched such that an  
3     opening is defined by the notch and the inner face of the casing.

1     45.     The ink-jet recording apparatus as set forth in claim 44, wherein the  
2     opening is situated so as not to face the nozzle forming surface when the  
3     flushing operation is performed.

1     46.     The ink-jet recording apparatus as set forth in claim 41, wherein the  
2     porous sheet member is secured to the casing by a fixing member, and  
3             the fixing member is situated so as not to face the nozzle forming  
4     surface when the flushing operation is performed.

1     47.     The ink-jet recording apparatus as set forth in claim 38, wherein the  
2     flushing region is situated each of the non-print regions.

1 48. The ink-jet recording apparatus as set forth in claim 38, wherein the  
2 flushing operation includes a first flushing for ejecting ink droplets of a first ink  
3 and a second flushing for ejecting ink droplets a second ink different from the  
4 first ink, and

5 wherein the first flushing is performed at a first position in the flushing  
6 region, and the second flushing is performed at a second position of the  
7 flushing region.

1 49. The ink-jet recording apparatus as set forth in claim 48, wherein the  
2 first flushing and the second flushing is performed in order.

1 50. The ink-jet recording apparatus as set forth in claim 48, wherein the  
2 second flushing is performed without stopping the carriage.

1 51. The ink-jet recording apparatus as set forth in claim 48, wherein the  
2 first flushing is performed before the carriage starts to travel.

1 52. The ink-jet recording apparatus as set forth in claim 48, wherein the  
2 first flushing is performed without stopping the carriage.

1 53. The ink-jet recording apparatus as set forth in claim 48, wherein the  
2 first position and the second position are fixed.

1     54.     The ink-jet recording apparatus as set forth in claim 48, wherein one  
2     of the first and second positions is fixed and the other is variable.

1     55.     The ink-jet recording apparatus as set forth in claim 48, wherein the  
2     recording head includes three pairs of nozzle orifice arrays, and

3             wherein a distance X between the first and second positions satisfies  
4     one of the following relationships:

5              $L1-L2 \leq X \leq L1+L2$ , and

6              $2(L1-L2) \leq X \leq 2(L1+L2)$

7     where L1 denotes a distance between the respective pairs of nozzle orifice  
8     arrays, and L2 denotes a distance between the respective nozzle orifice  
9     arrays.

1     56.     The ink-jet recording apparatus as set forth in claim 48, wherein the  
2     first position is situated at an outer traveling limit of the carriage, and a second  
3     position is situated where is closer to the print region than the first position.

1     57.     The ink-jet recording apparatus as set forth in claim 56, wherein the  
2     first ink is black ink, and the second ink is at least one of cyan ink, magenta ink  
3     and yellow ink.

1     58.     The ink-jet recording apparatus as set forth in claim 56, wherein the  
2     first ink is at least one of cyan ink, magenta ink and yellow ink, and the second  
3     ink is black ink.

1     59.     The ink-jet recording apparatus as set forth in claim 38, further  
2     comprising a flushing position controller including means for inputting a value  
3     for adjusting a timing of outputting a flushing drive signal for triggering the  
4     flushing operation.

1     60.     The ink-jet recording apparatus as set forth in claim 59, wherein the  
2     adjusting value is inputted as a first value for correcting a preset flushing  
3     position of one of the nozzle orifice of the recording head.

1     61.     The ink-jet recording apparatus as set forth in claim 60, wherein the  
2     first correcting value is managed by counting reference pulses, and  
3             wherein a second correcting value for a preset flushing position of  
4     another nozzle orifice is managed by a delay time period from a flushing drive  
5     signal based on the first correcting value.

1     62.     The ink-jet recording apparatus as set forth in claim 60, wherein the  
2     first correcting value is managed by counting reference pulses, and  
3             wherein a second correcting value for a preset flushing position of  
4     another nozzle orifice is also managed by counting the reference pulses.

1     63.     The ink-jet recording apparatus as set forth in claim 60, wherein the  
2     reference pulses is an encoder signal generated according to the traveling of  
3     the carriage.

1     64.     The ink-jet recording apparatus as set forth in claim 63, further  
2     *comprising a non-volatile memory for storing the correcting values, and*  
3             wherein the output timing of the flushing drive signal is determined  
4     with reference to the correcting values in the non-volatile memory and the  
5     encoder signal.

1     65.     The ink-jet recording apparatus as set forth in claim 59, further  
2     comprising a plate member provided with an aperture situated in the flushing  
3     region,  
4             wherein the aperture is situated between the recording head and the  
5     ink absorbing member, and  
6             wherein the aperture is smaller than a size of surface on which the  
7     nozzle orifices are formed.

1     66.     The ink-jet recording apparatus as set forth in claim 59, wherein the  
2     nozzle orifices form a plurality of nozzle rows in the recording head; and  
3             wherein the flushing position controller controls the flushing operation  
4     such that each nozzle row coming to a predetermined flushing position starts  
5     to eject ink drops.

1     67.     The ink-jet recording apparatus as set forth in claim 66, wherein a  
2     nozzle row arranged further from the moving direction of the carriage when the  
3     flushing operation is performed is used for ejecting ink which requires less  
4     flushing operation.

1        68.        The ink-jet recording apparatus as set forth in claim 66, wherein the  
2        *flushing operation is performed when the carriage is accelerated.*

1        69.        The ink-jet recording apparatus as set forth in claim 59, wherein the  
2        nozzle orifices form a plurality of nozzle rows in the recording head; and  
3        wherein the flushing position controller controls the flushing operation  
4        such that all nozzle rows ejects ink drops when the carriage starts to move.

1        70.        The ink-jet recording apparatus as set forth in claim 69, wherein a  
2        nozzle row arranged further from the moving direction of the carriage when the  
3        flushing operation is performed is used for ejecting ink which requires less  
4        flushing operation.

1        71.        The ink-jet recording apparatus as set forth in claim 38, further  
2        comprising a ventilation fan,  
3        wherein the ventilation fan is halted during the flushing operation.

1        72.        An ink-jet recording apparatus comprising:  
2        a plurality of ink-jet recording heads mounted on a carriage which  
3        travels in the widthwise direction of a recording medium for recording an image  
4        thereon by ejecting ink droplets from nozzle orifices provided therewith;  
5        a flushing region situated on the traveling path of the carriage in at  
6        least one of non-print regions which are arranged both sides of a print region,  
7        *the flushing region for receiving ink droplets ejected from the moving recording*  
8        *head when a flushing operation is performed; and*

9           a flushing position controller including means for inputting a value for  
10   adjusting a timing of outputting a flushing drive signal for triggering the flushing  
11   operation.

1   73.     The ink-jet recording apparatus as set forth in claim 72, wherein the  
2   adjusting value is inputted as a first value for correcting a preset flushing  
3   position of one of the plural recording heads.

1   74.     The ink-jet recording apparatus as set forth in claim 73, wherein the  
2   first correcting value is managed by counting reference pulses, and  
3           wherein a second correcting value for a preset flushing position of the  
4   other recording head is managed by a delay time period from a flushing drive  
5   signal based on the first correcting value.

1   75.     The ink-jet recording apparatus as set forth in claim 73, wherein the  
2   first correcting value is managed by counting reference pulses, and  
3           wherein a second correcting value for a preset flushing position of the  
4   other recording head is also managed by counting the reference pulses.  
5

1   76.     The ink-jet recording apparatus as set forth in claim 73, wherein the  
2   reference pulses is an encoder signal generated according to the traveling of  
3   the carriage.

1   77.     The ink-jet recording apparatus as set forth in claim 76, further  
2   comprising a non-volatile memory for storing the correcting values, and



3            wherein the output timing of the flushing drive signal is determined  
4       with reference to the correcting values in the non-volatile memory and the  
5       encoder signal.

1       78.       The ink-jet recording apparatus as set forth in claim 72, further  
2       comprising:

3            a plate member provided with an aperture situated in the flushing  
4       region; and

5            an ink absorbing member for receiving the ink droplets which have  
6       been passed through the aperture,

7            wherein the aperture is smaller than a total size of surface of the  
8       plural recording heads on which the nozzle orifices are formed.